Appl. No. 09/749,332   Docket No. MIT-070PUS
Reply to Final Office Action of July 6, 2005

Amendments to the Claims:

This listing of the claims will replace all prior versions, and listings, of the claims in the application:

1   1. (currently amended) A method of forming a network from a plurality of nodes and a base
2   station which is separate from the plurality of nodes, the method comprising the steps of:
3   (a) identifying at least one node of the plurality of nodes to operate as a cluster-head;
4   (b) forming a plurality of clusters from the plurality of nodes, each of the clusters having at least
5   one cluster-head;
6   (c) transmitting data from at least one node in at least one of the plurality of clusters to the
7   cluster-head in that cluster;
8   (d) transmitting data from at least one cluster-head to the base station; and
9   (e) identifying a different one of the plurality of nodes to operate as a cluster-head.

1   2. (Previously Presented) The method of claim 1, wherein the step of forming a plurality of
2   clusters further comprises the steps of:
3   advertising an availability of each of said plurality of cluster-heads; and
4   establishing a communication path between each of said plurality of cluster-heads and at
5   least one of the plurality of nodes, not operating as a cluster-head, to form a cluster.

1   3. (Previously Presented) The method of claim 2 wherein the step of establishing a
2   communication path between the cluster-head and each of the at least one of the plurality of
3   nodes comprises the steps of:
4   transmitting a status signal from each one of said plurality of cluster-heads;
5   receiving at each of the plurality of nodes one or more of the status signals;
6   comparing, at each of the plurality of nodes, not operating as a cluster-head, signal
7   strengths of the received one or more status signals; and
8   joining a particular one of the cluster-head's cluster as a result of the comparison.

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1   4. (Previously Presented) The method of claim 3, wherein the step of joining a particular cluster
2   is based on a determination, by at least one of the plurality of nodes, of the cluster-head
3   transmitting the status signal having a highest received signal strength.

1   5. (Original) The method of claim 2 further comprising the steps of:
2   generating at the cluster-head, a schedule having allotted slots for transmission;
3   transmitting data from at least one node to the cluster-head during the allotted slots;
4   receiving data in the cluster-head that are transmitted from at least one node; and
5   transmitting data from the cluster-head to the base station.

1   6. (Original) The method of claim 5, wherein the step of receiving data in the cluster-head
2   further comprises the step of reducing data transmission latency by using application-specific
3   data aggregation to reduce the amount of redundant data sent to the base station.

1   7. (Original) The method of claim 5, wherein the step of receiving data in the cluster-head
2   further comprises the step of increasing the signal to noise ratio of the data sent to the base
3   station by using application-specific data aggregation.

1   8. (Original) The method of claim 5, wherein the step of generating a schedule uses a time
2   division multiplexing protocol.

1   9. (Original) The method of claim 5, further comprising the step of beamforming the data
2   received from the plurality of nodes in the cluster.

1   10. (Original) The method of claim 1, wherein the step of identifying at least one of the
2   plurality of nodes to operate as a cluster-head further includes the step of randomly selecting one
3   of the plurality of nodes to be a cluster-head.

1   11. (Original) The method of claim 10, wherein the step of randomly selecting one of the
2   plurality of nodes to be a cluster-head is based on a probabilistic function of an amount of energy
3   remaining in each of the plurality of nodes.

1   12. (Previously Presented) The method of claim 1, wherein the step of forming a plurality of
2   clusters further comprises the steps of:
3   collecting data on a status of each of the plurality of nodes;
4   assigning each of the plurality of nodes to a particular one of a plurality of clusters.

1   13. (currently amended) A method for forming a network from a base station and a plurality of
2   nodes wherein the base station is separate from the plurality of nodes, the method comprising the
3   steps of:
4   electing a cluster-head from the plurality of nodes;
5   establishing a communication path between first ones of the plurality of nodes and the
6   cluster-head to form a cluster;
7   establishing a first round of data transmission;
8   transmitting from the first ones of the plurality of nodes to the cluster-head during the
9   first data transmission round; and
10   transmitting data from the cluster-head to the base station during the first data
11   transmission round.

1   14. (Original) The method of claim 13 further comprising the steps of:
2   electing a plurality of cluster-heads corresponding to a first set of cluster-heads for use
3   during the first round of data transmission; and
4   establishing a communication path between each of the plurality of cluster-heads and at
5   least one node of the plurality of nodes to form a first plurality of clusters.

1   15. (Original) The method of claim 14 wherein the step of electing a plurality of cluster-heads
2   is performed by the base station.

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1   16. (Previously Presented) The method of claim 15 wherein the base station elects cluster-heads

2   by minimizing an energy required during the first round of data transmission.

1   17. (Previously Presented) The method of claim 14 wherein:

2   during the first round of data transmission, each of the at least one node in each cluster

3   transmits data to the cluster-head of that cluster; and

4   each cluster-head transmits data to the base station during the first transmission round.

1   18. (Original) The method of claim 14 further comprising the steps of:

2   establishing a second round of data transmission;

3   determining whether each node of the plurality of nodes has operated as a cluster-head;

4   electing a second set of cluster-heads wherein each node in the second set of cluster-

5   heads has never before been a cluster-head; and

6   forming a second set of clusters about the second set of cluster-heads.

1   19. (Previously Presented) The method of claim 14 further comprising the steps of:

2   in each of a second set of clusters;

3   transmitting data from each node in the second set of clusters to the respective cluster

4   heads; and

5   transmitting data from each of the second set of cluster-heads to the base station.

1   20. (Original) The method of claim 14 further comprising the steps of :

2   establishing a second round of data transmission;

3   determining an amount of energy remaining in each node of the plurality of nodes;

4   electing a second set of cluster-heads, wherein the election is based on the amount of

5   energy remaining in each node of the plurality of nodes; and

6   forming a second set of clusters about the second set of cluster-heads.

1   21. (Original) A network comprising:

2   a base station; and

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1   a plurality of nodes comprising:

2   a cluster-head selector processor; and

3   a cluster selector processor, each cluster comprised of a subset of said plurality of

4 nodes, and one of each of said subset of said plurality of nodes temporarily acting as a cluster-

5 head <u>wherein each of said plurality of nodes has a limited amount of remaining energy and the</u>

6 <u>cluster-head selector processor selects each of said plurality of nodes as a cluster-head based</u>

7 <u>upon the limited amount of remaining energy in each of said plurality of nodes and a number of</u>

8 <u>times each of said plurality of nodes has operated as a cluster head</u>.

1 22. (Original) The network according to claim 21, wherein each of the plurality of nodes is in

2 electrical communication with a sensor.

1 23. (Original) The network according to claim 21, wherein each of said plurality of nodes

2 further comprises a sleep mode.

1 24. (Original) The network according to claim 21, wherein each of said plurality of nodes

2 further comprises an adjustable transmission energy level.

1 25. (Original) The network according to claim 21, wherein each of said plurality of nodes

2 further comprises a low energy mode, and a high energy mode.

1 26. (cancelled) ~~The network according to claim 21, wherein each of said plurality of nodes has~~

2 ~~a limited amount of remaining energy; and~~

3 ~~wherein the cluster-head selector processor selects each of said plurality of nodes as a~~

4 ~~cluster-head based on the limited amount of remaining energy in each of said plurality of nodes~~

5 ~~and a number of times each of said plurality of nodes has operated as a cluster head.~~

1 27. (Original) The network according to claim 21, wherein each of said plurality of nodes

2 further comprises a signal strength processor.

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1   28. (Original) The network according to claim 27, wherein the cluster selector processor
2   determines the cluster selection in response to a signal from the signal strength processor.

1   29. (Original) The network according to claim 21, wherein the base station selects each of said
2   plurality of nodes to temporarily act as a cluster-head.

1   30. (Original) The network according to claim 21, wherein the base station determines which of
2   each of said plurality of nodes is included in each temporary cluster.

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